IPV6; MOBILE IP ADDRESS AND ITS RELATIONSHIP WITH EDUCATION

Oleh

ARIFFIN ABDUL MUTALIB

Sekolah Teknologi Maklumat
Universiti Utara Malaysia
06010 Sintok, Kedah
am.ariffin@uum.edu.my

ABSTRACT

The prospect of an exhausted supply of address space in the current Internet protocol IPv4, prompted the Internet Engineering Task Force (IETF) to start a new generation of IP project in the previous two decades. The resulting IPv6 offers a 128-bit address space and other upgrades that support the auto configuration of new hosts. This paper talks about IPv6 in general. It gives a big picture about the advantages of moving from IPv4 to IPv6 as well as the disadvantages. Besides, it looks also into the current marketplace, about the IPv6 technology offers, the scenario and current practice in Malaysia. Lastly, this paper relates the importance of mobile network devices with the education.

Keyword: IPv6, IP addresses, address space

INTRODUCTION

Over 20 years ago, in September 1981, IPv4 has been completed also known as RFC 791. Since then, for 20 years we have been using IPv4 happily (Demaria, 2002) without any doubt. Today, as more people in more countries are connecting to the Internet from day to day with more and latest types of devices, there will exist one big problem; the IP address would gradually run out. The world is moving towards mobile, the introduction of web-enabled PDAs, cars, televisions, cameras, home security systems and other fixed and on-the-go technologies have accelerated the need for available IP addresses (Suomela, 1st Dec 2001). Engineers and other technical people see it as a serious technical problem. However, that situation could be addressed when the network address translators allow ISPs to assign temporary IP address to users as they connect, but, as there are so many mobile devices coming into use everyday, and many more waiting to be used after launching, it would cause problem (Hooper, 2001). Already some UK colleges, and some departments in universities, are running Network Address Translation (NAT) to serve a large number of networked hosts like wireless PDAs, laptops and embedded systems behind a small pool of public IP addresses.

From the problem raised above, the next generation version of IP has been developed and shown its live implementation (Lawson, Miyake & Evers, 2002). That seems to be good news for everyone who cares about such the devices. The implementations are not trials but still in the early stages and participants are struggling with problems related to the new

technologies, namely security issues and are still not sure how to use the new capabilities offered by IPv6. IPv6 offers very reliable "always-on" Internet (hAnluain, 2001) that requires a dedicated IP. In other words, all wireless devices need to have IP addresses to be able to work efficiently (Hooper, 2001).

In Japan, Information Service International-Dentsu (ISID), a systems integration company based in Tokyo has begun building a working IPv6 network inside the company, and it will connect more than 5000 systems (Lawson, Miyake & Evers, 2002). Seiji Kumagai, chief research scientist in the E-Technology department at ISID added that despite ISID's head start in deploying IPv6, adoption within the company has been slow so far. The systems have both stacks of IPv4 and IPv6 as to migrate gradually (Lawson, Miyake & Evers, 2002).

It is said that by the time China hosts the Olympics in 2008, they will have installed the entire needed infrastructure to support everybody involve with the game (Morrison, 2002).

THE ADVANTAGE OF UPGRADING TO THE NEW PROTOCOL

The main important advantage of upgrading the protocol to IPv6 is the increased address space. IPv4 addresses are 32-bit long, written as four groupings of eight bits; IPv6 addresses on the other hand are 128-bit long, written in eight groupings of 16 bits (Demaria, 2002). This means, IPv4 could offer up to 4 billion unique numbers, while IPv6 offers up to hundreds of trillions of unique 128-bit addresses (hAnluain, 2001). Out of all IPv4 unique numbers, 75 percent or 3 billions have been assigned. All phone numbers on the earth likely need to be change. When IPv6 is fully developed, it is almost impossible for the unique numbers to be fully assigned within such short period. They both could be visualized by imagined that IPv4 is an inch; IPv6 is the diameter of the Milky Way (hAnluain, 2001).

Other than that, users do not need to memorize the important internal IP address because it is hard. Here is an example of the new IP address; E2A4:C0FF:EE0B:EEF3:0924:00A3:0001:A3B5, will everyone remember? There might be some do, but if there is any alternative, we would prefer to ignore it of course. Fortunately, all leading zeros can be omitted, so the above IP address can be simplified as C0FF:EE0B:EEF3:924:A3:1:A3B5. There is not much improvement, but it is an improvement in fact (Demaria, 2002).

Other advantage is we do not have to convert IPv4 addresses to IPv6 addresses. The addresses for IPv4 can still be used for networks using IPv6. For example, ::172.26.5.81 in IPv6 is describing the IPv4 address 172.26.5.81 (Demaria, 2002). There is no need to convert IP addresses from base 10 (Decimal) to base 16 (Hexadecimal), just need to prepare to rely very strongly on DNS systems to make easier to connect to internal hosts.

According to The American Registry for Internet Numbers (ARIN), it is going to be more cautious handling IPv6 addresses than InterNIC and any other groups were with IP addresses. In 1980s, a lot of spaces were simply wasted because organizations that required 257 addresses got a class B network (65,536 entries). They did not return the unused space because they need to reconfigure and possibly renumber their IP infrastructures by doing so. Additionally, they might need to reconfigure all routers as well in order to reflect the new addresses, change the hard-coded IP addresses and could also cause failure in network monitoring software (Demaria, 2002).

The built-in autoconfiguration mechanism in IPv6 protocol is claimed to make renumbering be simpler. There is no need to assign the addresses manually as is in IPv4; or in IPv4, a BOOTP or DHCP server dictates it. However, there is no intervention to make a node able to determine a unique, globally routable Internet address. In contrast, IPv6 stack has got a device that can obtain a routable address automatically by combining its Medium Access Control (MAC) address with a network prefix from the nearest router. Without any intervention, embedded systems and roaming devices can connect directly to the Internet (Demaria, 2002).

The new protocol also allow better security through encryption and authentication, said Stephen Deering, a Cisco Systems fellow and lead designer of IPv6. Network address translators change packets as they travel across the Internet and this makes encryption and authentication solutions view those changes as tempering. As everybody on the earth could have thousands of IP addresses, the IP address will be stable; a stable IP address therefore allows for encrypted data packets to be delivered unchanged (Hooper, 2001).

THE DISADVANTAGES OF UPGRADING TO THE NEW PROTOCOL

It is very complicated for companies to change the network provider and needs to renumber because all routers need to be reset, subnets need to be reallocated and all hard-coded IPs changed. Furthermore, licenses tied need to be updated or rekeyed and firewall rules need to be updated as well (Demaria, 2002).

Updating DNS entries globally (including expiring caches) will be delayed and can vary from a few hours to days or weeks or longer. Renumbering, although sounds simple actually costs a lot. It could translate into millions of dollars in downtime and working hours for renumbering. Autoconfiguration will work fine for networks with small to medium number of computers (small to medium network) and for companies that depend on devices like cell phones (Demaria, 2002).

THE REALITY IN TODAY MARKET PLACE

Concerning the future needs, vendors are starting to integrate the products with IPv6 network. For example, Cisco has incorporated IPv6 in its Internetwork Operating System (IOS) software for routers and switches, (Hooper, 2001) but only in software (Lawson, Miyake & Evers, 2002). Some of the firewall's features such as intrusion detection and VPN termination are not offered for IPv6. Additionally, its Fix Firewall does not yet support IPv6. To overcome the situation, Check Point Software Technologies, a leading maker of firewall software, adds basic support for IPv6 for future release. Unfortunately, Check Point works with selected customers on specific needs for IPv6 migration (Lawson, Miyake & Evers, 2002).

IBM, Microsoft, Hewlett-Packard, Sun Microsystems and Motorola on the other hand are implementing IPv6 in hardware, software and operating system for enabling business applications to run on IPv6 networks (Hooper, 2001).

Microsoft has included a dual IPv4 and IPv6 stack in its Windows XP. The company hopes that it is used in building IPv6-ready applications and devices. And Microsoft is planning to introduce an IPv6 stack in an upgrade to Windows XP, as well as in its next server OS. Currently, its server OS, Windows 2000 Server includes a software development kit for building IPv6 applications and devices (Lawson, Miyake & Evers, 2002).

Solaris product line manager, Bill Moffitt said, California-based Sun Microsystems' Solaris, Palo Alto has included IPv6 capability since the first commercial release of its current version, Solaris 8 in 2000. He added, if a Solaris 8 server is plugged into an IPv6 network, it could begin exchanging IPv6 packets automatically (Lawson, Miyake & Evers, 2002).

CURRENT PRACTICE IN MALAYSIA

As we look nearer or as we block our vision to just in Malaysia, we will never see a single company or organization implementing IPv6 within their premises. In fact, not many of us have heard about the term IPv6, also IPv4. The technology in Malaysia is still considered slow moving making the need for IP addresses is still under control. We are still far behind compared to the countries like the USA, Japan, China and some others where this countries use the technology very broadly. They have started to use mobile devices as the needs. In Malaysia, we do not really appreciate mobile devices because there is no need for us to do so, furthermore, the technology still does not exist.

However, there are researchers within our country trying to migrate their network from IPv4 to IPv6. But, the experiment is still on progress and they do the researches phase by phase.

In UiTM Shah Alam, there are a group of lecturers trying to develop a network using IPv6 technology. They started the project by buying a number of appropriate devices including PCs and a server besides the transmission media. For that specific purpose, they began with connecting from a host to another host. After having gathered a successful result, they move a step further by connecting a subnet to another subnet.

From their experiments, they have collected a positive result about the protocol. From my interview with one of the group members, Yusnani Mohd Yusoff, they got a positive result and concluded that IPv6 could be implemented in Malaysia. And they have overcome some of the problems, for example conflicts to transmit or receive from a device with IPv4 to or from a device with IPv6. Other than that, they have also overcome the auto configuration problem.

THE IMPORTANCE OF MOBILE IP ADDRESS IN EDUCATION IN MALAYSIA

As education is moving on to be very smartly where students are always encouraged to be using technological devices especially in higher institutions, of course the migration to the new IP generation is appropriate. Students are able to bring their laptops anywhere and still being connected to the network, rather than having to stay at a certain place to be connected. It is seen to be very meaningful because not only retrieving the Internet to search for resources is important, other utilities provided by the network are also very important in such the very demanding life style.

As the Internet and WWW is very important and looked as a very smart medium for sharing resources, gaining ideas and other functions, it is better for the users to be able to retrieve at any time.

There are so many different types of data for educational purposes, depending on the relevant fields. Students of multimedia fields (as the very critical field in transferring data) will be able to transfer data of type video straight from anywhere, reducing lack of space problem. Nowadays, saving video is a very serious problem for many students, as it requires large space.

As people are talking about e-learning everywhere, there is a need to have the ability to access the Internet at anytime anywhere. Just imagine if users could use the Internet while in a train or bus; they could use apparatus like shared whiteboard, forum, turn in assignments after having done them during the journey and so on.

With mobile IP address, people will also be able to set up a collaborative job anywhere, just bring all the devices along, and start the CSCW at any time, as the network is available anywhere. It is much easier and more effective rather than the current trend where we have to be at a certain place for CSCW purpose.

That is the very clearly seen advantage for people involved in education; computers because not many other devices have been introduced in our country. As mentioned in the introduction, there are a lot of other devices would be networked when the technology is ready.

CONCLUSION

With the introduction of IPv6, by Internet Engineering Task Force (IETF), most of the disadvantages in IPv4 would be overcome. The "always-on" Internet without the need for dedicated IP is very helpful in the world with advanced technologies.

We need to move from negative to positive, old to new, and in IP address availability case, need to move from less to more spaces. As the whole world is moving towards IPv6, we also have to do the same thing. The later technologies will come together with the IPv6 ability, making all the users have to appreciate the new technology.

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